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REMARKS

Reconsideration is respectfully requested in view of the amendments and remarks herein.

Amendments After Final Action

Applicant submits that entry of the amendments herein after final Action is appropriate since the amendments are directly responsive to the new rejections under 35 USC 112 made in the final Action and do not raise any new issues. Applicant submits that the amendments either place the application in condition for allowance or better position for appeal.

Restriction/Rejoinder

In paragraph 2, the Action states that claims 34-40 are withdrawn from further consideration as drawn to a non-elected invention. Applicant presents process claim 34 and other process claims herewith. Claim 34 depends from claim 11, and thus if claim 11 is considered allowable applicant respectfully requests that claim 34 be rejoined as described in MPEP821.04. Applicant submits that the other process claims are also appropriate for rejoinder.

Claims 28-31

In paragraph 3, the Examiner presents an interpretation of claims 28-31. In paragraph 4, Claims 28-29 stand rejected under 35 USC 112, first paragraph. The general gist of the rejection is that the specification only supports use of a plasticized interlayer, since the specification states that unplasticized polyvinyl butyral is not suitable for use in glazing. In paragraph 5, claims 30 and 31 are stated to be duplicates.

Applicants believe that the Action properly describes claims 28-31, as previously presented.

Claim 28 is amended to recite "plasticized" as supported at page 4, lines 14-29. Claims 29 and 30 are cancelled. Claim 31 stands as previously presented.

Applicants submit that these claims are now proper since claim 28 does not read on unplasticized polyvinyl butyral and since claim 31 is no longer a duplicate.

Claims 11-33 and 41-43

Claims 11-33 and 41-43 stand rejected under 35 USC 112, second paragraph. In response to this rejection, applications have amended the claims to refer to thermoplastic polymer sheets comprising an unplasticized ethylene/ α,β -unsaturated copolymer ionomer prepared from ethylene and α,β -unsaturated carboxylic acids having from 3 to 8 carbon atoms wherein the acid groups of the copolymer have been at least partially neutralized. Consequently, withdrawal is respectfully requested.

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35 USC 103(b)

In paragraph 6, claims 11-27, 32-33 and 42-43 stand rejected under 35 USC 103(a) over Frost et al US 5,932,329 ("Frost") in view of Bolton et al US 4,668,574 ("Bolton") with, as evidence, US 5,082,738 ("Swofford").

Upon further review of this rejection, applicants note that their prior response improperly focused on Bolton et al US 4,906,703. Applicants apologize for any inconvenience and direct their response herein to Bolton et al US 4,668,574.

Applicant submits that the Action is based on an improper hindsight reconstruction of the invention and uses an improper "obvious to try" rationale. In addition, Applicants submit that the invention provides unexpected results.

Claim 11 is directed to a glass laminate useful for blocking the transmission of IR light, comprising a multiple layer interlayer comprising: (1) two thermoplastic polymer sheets; and (2) a film positioned between the thermoplastic polymer sheets such that the film is in contact on each of its surfaces with the sheets, wherein the film can either reflect or absorb IR light, and wherein the thermoplastic polymer sheets comprise an unplasticized ethylene/ α,β -unsaturated copolymer ionomer prepared from ethylene and α,β -unsaturated carboxylic acids having from 3 to 8 carbon atoms wherein the acid groups of the copolymer have been at least partially neutralized.

Claim 33 is directed to a multiple layer interlayer article useful for blocking the transmission of infra red (IR) light comprising: (1) two thermoplastic polymer sheets; and (2) a film positioned between the thermoplastic polymer sheets such that the film is in contact on each of its surfaces with the sheets, wherein the film can either reflect or absorb IR light, and wherein the thermoplastic polymer sheets comprise an unplasticized ethylene/ α,β -unsaturated copolymer ionomer prepared from ethylene and α,β -unsaturated carboxylic acids having from 3 to 8 carbon atoms wherein the acid groups of the copolymer have been at least partially neutralized

The general gist of the obviousness rejection is that it would have been obvious to a person of ordinary skill in the art to utilize the disclosure of Bolton in the invention of Frost to make a multilayer interlayer and glass laminate using the ionomer resin taught by Bolton to replace thermoplastic polyurethane and/or polyvinyl butyral.

Swofford is cited as describing use of silanes to enhance adhesion of ionomer to glass, polycarbonate or polyester. Reference is made to column 2, lines 18-25, and Example 1.

Frost describes a laminate of a film with IR reflecting coating sandwiched between two thermoplastic polyvinyl butyral layers. The polyvinyl butyral is sometimes referred to as a "glue" or "adhesive" as it is used to adhere the glass laminate. (See, e.g., column 2, lines 61-66.)

Support films include polyethylene terephthalate, polycarbonate, etc., as described at column 2, lines 50-53.

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Frost describes that distortion experienced in the past with these types of laminates is reduced or eliminated if the thermoplastic polyvinyl butyral sheet on one side is at most 50 μ m thick. (See, e.g., column 1, lines 58-62, column 2, lines 4-6, column 3, lines 8-33.) That is, Frost states:

"It has been found and confirmed by experiment that the observed optical distortion is completely or nearly completely avoided if the coated support film is glued on at least one side comparatively firmly to a glass sheet by a very thin adhesive layer. In this manner, the support film can no longer deform or shrink, because this is prevented by the firm bonding to one of the two glass sheets. It is unimportant here whether such shrinkage, which appears to be responsible for the hammering effect, takes place primarily in the coated support film or in the adhesive layers. It is indeed known that **polyvinyl butyral films** are always subject to internal stresses, and that these films relax and deform when exposed to heat. It is therefore possible that the shrinkage responsible for the effect take place primarily in the **polyvinyl butyral films** and are transferred to the support film. Distortion effects resulting therefrom are also avoided by the measures according to this invention."

Column 1, line 58-column 2, line 7. (Emphasis added.)

Frost is almost entirely focused on use of polyvinyl butyral, and merely mentions that possibility of using other adhesive layers near the end at column 3, lines 21-29. Virtually the entire patent application is focused on polyvinyl butyral. The paragraph bridging column 2-3 states that films of polyvinyl butyral are usually employed as thermoplastic adhesive layers in these applications. The figure is stated to be directed to use of polyvinyl butyral (see, column 2, lines - 37-43). Moreover, the problem solved by Frost is stated to be one associated with use of polyvinyl butyral.

Column 3, lines 8-20, of Frost explains that commercial polyvinyl butyral sheets are usually 0.38 mm in width, and that the second polyvinyl butyral layer is preferably 0.76 mm (760 μ m, 29.9 mil) in width. In contrast, the invention is based upon using a first polyvinyl butyral layer that is at most 50 μ m (0.05 mm, 1.96 mil).

Thus, it can be said that Frost places tremendous emphasis on problems encountered with producing laminates with polyvinyl butyral and describes a solution focused on the commercial polyvinyl butyral products.

Next, applicants point the Examiner to the paragraph describing other adhesive layers in Frost and submit that this paragraph is just an afterthought to support broader claims. In this regard, review of the patent and, in particular, the paragraph at issue shows that no interlayer adhesives other than polyvinyl butyral were tried and there is no way that this paragraph can be read to state anything other than that the invention might work with other plastics used as the thin layer if they are tried. The paragraph at issue is at column 3, lines 21-28, and states:

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“Both for the extremely thin first adhesive layer and for the second adhesive layer, any of the materials known from normal laminated glass can be considered for the adhesive layers. Preferably, thermoplastic material is used, so that the usual production process can be adopted without modification. More preferably, proven materials such as thermoplastic polyvinyl butyrals and thermoplastic polyurethanes are used.”

Here, applicants direct particular attention to the phrase “can be considered.” Use of this phrase shows that only polyvinyl butyral was tried and that the patentee is just speculating concerning other polymers.

Given the above, Frost is a very weak primary reference and there needs to be something in Bolton to lead the person ordinary skill in the art to substitute the ionomer interlayer of Bolton for the two polyvinyl butyral layers of Frost. As can be seen from the following discussion, Bolton does not provide that teaching or suggestion.

Bolton describes laminated article made with ionomer layers. The only pertinent embodiment seems to be described in Figure 6; column 2, lines 38-45; column 4, last paragraph; and Examples 2 and 3. That embodiment focuses on a glass laminate containing a polycarbonate layer sandwiched by two ionomer layers.

The Bolton specification describes use 30 mil (762 μm , 0.762 mm) thick layer of ionomer at column 5, lines 21-22, and then seems to state that the ionomer sheets can range in thickness from 1 to 200 mils (0.0256 to 5.08mm) at column 5, lines 28-29. Examples 2 and 3 use two 0.7 mm (700 μm , 27.6 mil) thick ionomer resin layers to sandwich a 3 mm thick polycarbonate layer. Thus, it can be that Bolton only used layers that are comparable to the thick layer of Frost, and there is no way of determining from the teachings of Bolton whether ionomer layers of at most 50 μm will work in combination with these thicker layers and, if so, whether the benefits of Frost will be obtained.

Given these teachings, the person of ordinary skill in the art would certainly not be led to conclude that ionomer of at most 50 μm should be substituted for the polyvinyl butyral layer of Frost. Nowhere in the rejection does the Action explain why it would be expected that such a substitution would be successful and provide the benefits obtained in Frost with polyvinyl butyral.

In fact, given Frost’s teachings related to the problems encountered with polyvinyl butyral there is no basis for combining these teachings. That is, since Frost is only directed to problems described to be encountered with polyvinyl butyral films, the person of ordinary skill in the art would not be led to substitute ionomer for the polyvinyl butyral films of Frost. In this regard, please consider the following description of the problem and solution in Frost:

“It is unimportant here whether such shrinkage, which appears to be responsible for the hammering effect, takes place primarily in the coated support film or in the adhesive layers. It is indeed known that **polyvinyl butyral films** are always subject to internal stresses, and that these films relax and deform when exposed to heat. It is therefore possible that the shrinkage responsible for the effect take place

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primarily in the **polyvinyl butyral films** and are transferred to the support film. Distortion effects resulting therefrom are also avoided by the measures according to this invention."

Column 1, line 64-column 2, line 7. (Emphasis added.) Since Frost makes it clear that the problems encountered are specific to polyvinyl butyral, and merely speculates as to whether other interlayer materials would be suitable, and since Bolton only describes the use of thicker ionomer interlayer, there is no basis for the conclusion in the Action that the person of ordinary skill in the art would be led to combine these two patents to use ionomer layers in place of the polyvinyl butyral layers of Frost, and withdrawal of the rejection with respect to all of the claims is respectfully requested.

In considering the rejection, it is important to note that Frost claims priority from an August 16, 1996 filing, which is well after the March 1990 grant date of Bolton. Moreover, from the related applications listed in Bolton, it can be seen that counterparts issued in the 1980's. Therefore, Frost should have been well aware of the Bolton patents and their disclosure. This supports applicant's position that the Frost patent is focused on polyvinyl butyral. If Frost thought ionomer would be a good alternative for the described laminate, then Frost could have disclosed that an ionomer interlayer would work in the disclosed laminate. Instead, Frost focused on polyvinyl butyral. Given Frost's focus on polyvinyl butyral, and the fact that Frost fails to mention ionomer in the patent, the person of ordinary skill in the art would be led to believe that Frost is focused on a problem with polyvinyl butyral sheets and would be led away from use of ionomer.

Applicant also points out that the invention is not directed to use of ionomer, but to "unplasticized" sheets of ionomer. This is a very important feature of the invention since one interlayer-related problem encountered with coated IR-blocking films is that interlayers that absorb moisture and contain acidic functional groups and various ions can corrode the metal flakes or coatings that are present on some IR-blocking films. Laminates of the present invention do not contain plasticizers or other mobile components that can migrate or leach, and additionally do not promote the absorption of water. Thus the laminates of the present invention substantially reduce the occurrences of interlayer-related defects described herein.

The use of "unplasticized" sheets of ionomer as in the invention provides many benefits that are not achieved using other interlayer sheets. Unplasticized polyvinyl butyral, for example, would not be suitable for use as the interlayer which is in direct contact with the IR film because unplasticized PVB is not suitable for use in glazing due to properties such as high modulus and low tensile strength, which would negatively impact the performance of the glazing in such applications as windows and automobile windshields, for example.

Concerning this point, applicant submits that the diamines used in Bolton both crosslink and plasticize the ionomer. The addition of diamines lower the viscosity of the ionomer melt and make the polymer less stiff, and thus the diamines exhibit typical of

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behaviors of a plasticizer. Thus, the combination of Frost and Bolton would not lead the person of ordinary skill in the art to the unplasticized ionomer interlayer of the invention.

Additionally, applicants direct the Examiner's attention to the examples presented in the specification which show the unexpected advantages obtained by using the claimed ionomer interlayers when compared with polyvinyl butyral interlayers. Please note that the comparative samples prepared with polyvinyl butyral experienced edge color and corrosion problems, whereas the ionomer interlayer containing samples of the invention did not experience these problems.

The data in the specification shows that ionomers overcome a significant problem. In fact, please note that Frost at column 3, lines 33-39, specifically indicates that the Frost patent does not include details concerning how to prevent the corrosion of the IR-reflective layer at the edge, thus recognizing the problems encountered with polyvinyl butyral interlayers and confirming that applicants' data is showing an unexpected benefit of the invention.

Example 1 shows preparation of an IR-blocking laminate of the present invention using a multi-layered IR-reflecting film and two sheets of ionomer resin. This laminate sample was inspected for defects, including corrosion, dimpling, air bubbles, and delamination. No defects were present. This laminate sample was then subjected to a bake test at 90°C for five (5) weeks, and no edge color developed. In contrast, Comparative Example 1 was prepared using the procedure of Example 1 except that two polyvinyl butyral resin (22.4% hydroxyl) sheets, plasticized with 36 pph tetraethylene glycol 2-heptanoate (4G7), were used instead of the ionomer resin sheeting. The sample was subjected to the bake test (90°C/5 weeks) and developed very bright red edge color measuring 5mm wide. This edge color was present on all four edges. In addition, in Comparative Example 2 the procedure of Example 1 was repeated except that two polyvinyl butyral resin sheets (18.5% hydroxyl), plasticized with 36 pph triethylene glycol 2-hexanoate (3GO), were used instead of the ionomer resin sheeting. The sample was subjected to the bake test (90°C/5 weeks) and developed a uniform greenish-yellow edge color measuring 1mm wide. This edge color was present on all four edges.

Example 6 shows preparation of an IR reflective laminate of the invention using a second coated IR reflective film and two sheets of ionomer. The laminates were inspected for corrosion and other defects but none were found. The laminate samples were then subjected to a bake test at 90°C for six (6) weeks, and no corrosion or color change developed. In contrast, Comparative Example 3 repeated the procedures of Example 6 except that two polyvinyl butyral resin (22.4% hydroxyl) sheets, plasticized with 36 pph tetraethylene glycol 2-heptanoate (4G7), were used instead of the ionomer resin sheeting. The samples were subjected to the bake test (90°C/6 weeks) and they developed many spots of corrosion on the reflective coating of the IR films.

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Thus, it can be seen that the invention unexpectedly provides laminates that do not have the problems encountered with polyvinyl butyral laminates.

Swofford is cited with respect to the silane priming agents and, thus, will be discussed below with respect to the claims focused on that embodiment.

For the above reasons, applicant submits that the Action is based on an improper hindsight reconstruction of the invention and uses an improper "obvious to try" rationale. In addition, Applicants submit that the invention provides unexpected results. Consequently, applicant respectfully requests allowance of the claims.

Claims Reciting Priming The Film

Claim 13 is directed to a glass laminate wherein the film is primed using a priming agent prior to lamination. Claim 14 states that the priming agent of claim 13 is a silane compound or solutions thereof. Other claims depending from claim 13 are presented.

Applicant submits that the person of ordinary skill in the art would be led away from using the priming agent in the polyvinyl butyral laminates of Frost given Frost's goals.

The person of ordinary skill in the art would be led away from using the priming agent in the polyvinyl butyral laminates of Frost given Frost's goals. As discussed above, Frost describes that distortion experienced in the past with these types of laminates is reduced or eliminated if the thermoplastic polyvinyl butyral sheet on one side is at most 50 μm thick. Frost states:

"It has been found and confirmed by experiment that the observed optical distortion is completely or nearly completely avoided if the coated support film is glued on at least one side comparatively firmly to a glass sheet by a very thin adhesive layer. In this manner, the support film can no longer deform or shrink, because this is prevented by the firm bonding to one of the two glass sheets."

Column 1, line 58-column 1, line 63. This goal would seem to be defeated by adding a coating or anything else that would increase the distance between the glass and the support film. Thus, applicants submits that the very teachings of Frost would lead the person of ordinary skill in the art from use of a priming agent.

Claims 28-31 and 41

In paragraph 7, the Action indicates that Claims 28-31 and 41 would be allowable if redrafted in independent form and to overcome the 35 USC 112 rejection. Applicant thanks the Examiner for pointing out the allowability of these claims and have submitted amendments to overcome the 35 USC 112 rejection. Applicant has not redrafted them in independent form.

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In view of the foregoing, allowance of the above-referenced application is respectfully requested. Should any matters remain unresolved by this response, the Examiner is invited to telephone the undersigned at the below-listed direct dial telephone number in order to expedite prosecution.

Respectfully submitted,



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